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Matters for consideration or action by the Conference of the Parties: environmentally sound interim storage of mercury other than waste mercury

Guidelines on the environmentally sound interim storage of mercury other than waste mercury

Note by the secretariat

1. At its first meeting, the Conference of the Parties to the Minamata Convention on Mercury considered the development of guidelines in relation to the environmentally sound interim storage of mercury other than waste mercury, as required pursuant to paragraph 3 of article 10 of the Convention. In its decision MC-1/18, the Conference of the Parties requested the secretariat to undertake further revision of the draft guidelines presented to the first meeting by seeking technical input from relevant experts, amending the guidelines and publishing the revised draft version on the Minamata Convention website for comment from experts, parties and others, and further revising the guidelines on the basis of the input received.

2. The secretariat has undertaken the revision as requested and is presenting the revised draft guidelines to the Conference of the Parties for further consideration and possible adoption. A draft decision in this regard is presented as annex I to this note, while the revised draft guidelines are presented as annex II.

Suggested action by the Conference of the Parties

3. The Conference of the Parties may wish to consider the revised draft guidelines on the environmentally sound interim storage of mercury other than waste mercury and adopt the guidelines for use.

* UNEP/MC/COP.2/1.

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Annex I

Draft decision MC-2/[XX]: Environmentally sound interim storage of mercury other than waste mercury

The Conference of the Parties,

Recognizing the need to assist Parties in the environmentally sound interim storage of mercury other than waste mercury through the provision of guidelines,

1. *Adopts* the guidelines on the environmentally sound interim storage of mercury other than waste mercury and calls on the Parties to the Minamata Convention on Mercury to take them into account in complying with their obligation to take measures to ensure that the interim storage of such mercury and mercury compounds intended for a use allowed to a Party under the Convention is undertaken in an environmentally sound manner;

2. *Notes* that the guidelines may need to be revised in the future to ensure that they continue to reflect best practice.

Annex II

Revised draft guidelines on the environmentally sound interim storage of mercury other than waste mercury

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I. Introduction

1. The Minamata Convention on Mercury is a global legally binding instrument with the objective of protecting human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. The Convention contains obligations relating to emissions and releases of mercury and mercury compounds resulting from all stages of the life cycle of mercury, including supply, trade, use, waste and contaminated sites. Specific obligations relating to the environmentally sound interim storage of mercury and mercury compounds other than waste mercury are set out in article 10 of the Convention. These obligations are different from the obligations for the environmentally sound management of mercury wastes, which are set out in article 11.

2. Article 10 of the Convention stipulates that the Conference of the Parties to the Minamata Convention shall adopt guidelines on the environmentally sound interim storage of mercury and mercury compounds, taking into account any relevant guidelines developed under the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal and other relevant guidance. These guidelines have been prepared on that basis.

3. These guidelines do not establish mandatory requirements or attempt to add to, or subtract from, a party's obligations under the Convention, in particular article 10. However, parties are required to take measures to ensure that the interim storage of mercury and mercury compounds is undertaken in an environmentally sound manner, and, in doing so, to take into account any guidelines adopted by the Conference of the Parties, as well as any requirements for interim storage that the Conference of the Parties may decide to adopt and annex to the Convention pursuant to article 27. This could include the use of national arrangements established prior to the adoption of these guidelines that, given a party's natural and social conditions, provide an equivalent or better system for the environmentally sound interim storage of mercury and mercury compounds, to which the individual clauses in these guidelines can be applied as long as they are practicable and consistent.

II. Scope of the guidelines

4. These guidelines provide guidance for the environmentally sound interim storage of mercury and mercury compounds intended for a use allowed to a party under the Convention. This guidance complements the requirements for the environmentally sound management of mercury waste. Under the Convention, certain uses of mercury and mercury compounds are not allowed after a certain date. (For example, the use of certain mercury-added products is not allowed after a phase-out date specified in annex A under article 4 of the Convention.) All uses of mercury and mercury compounds not specified in the Convention as being not allowed are considered to be allowed to a party under the Convention. Identifying priority actions within the context of these guidelines may also be appropriate, particularly if a party has determined that artisanal and small-scale gold mining (ASGM) and processing in its territory are more than insignificant. Parties that are developing or have developed an ASGM national action plan, for example, may want to consider prioritizing the sections of these guidelines that facilitate implementation of the actions specified in paragraph 1 of annex C of the Convention, in addition to taking into account the guidance on developing a national action plan to reduce and, where feasible, eliminate mercury use in ASGM adopted by the Conference of the Parties at its first meeting (UNEP, 2017a).

5. These guidelines do not consider options for final or permanent storage of mercury or for its stabilization or solidification. Those options are considered to relate to the environmentally sound management of mercury waste and are covered in the technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with mercury or mercury compounds developed under the Basel Convention (UNEP, 2015). It should be noted that, while those guidelines are publicly available, not all parties to the Minamata Convention are parties to the Basel Convention.

6. Article 10 of the Minamata Convention applies to the interim storage of mercury and mercury compounds as defined in article 3 of the Convention that do not fall within the definition of mercury wastes set out in article 11. Article 10 therefore covers (a) mercury (elemental); (b) mixtures of mercury with other substances, including alloys of mercury, with a mercury concentration of at least 95 per cent by weight; and (c) mercury compounds, namely mercury(I) chloride (known also as calomel), mercury(II) oxide, mercury(II) sulphate, mercury(II) nitrate, cinnabar and mercury sulphide.

7. Additionally, as mercury and mercury compounds falling within the definition of mercury wastes under article 11 of the Convention are not covered by article 10, that article does not cover substances or objects (a) consisting of mercury or mercury compounds; (b) containing mercury or mercury compounds; or (c) contaminated with mercury or mercury compounds in a quantity above the

relevant thresholds defined by the Conference of the Parties, in collaboration with the relevant bodies of the Basel Convention in a harmonized manner, that are disposed of or are intended to be disposed of, or are required to be disposed of by the provisions of national law or the Minamata Convention. This definition excludes overburden, waste rock and tailings from mining, except from primary mercury mining, unless they contain mercury or mercury compounds above thresholds defined by the Conference of the Parties.

8. The Convention stipulates that each party shall take measures to ensure that the interim storage of mercury and mercury compounds intended for a use allowed to a party under the Convention is undertaken in an environmentally sound manner, taking into account any guidelines and in accordance with any requirements adopted. The Convention does not include a definition of the term "interim". The English word "interim" is commonly understood to mean "in or for the intervening period; provisional or temporary" (definition appearing in the Oxford English Dictionary). In the case of the Minamata Convention, it would therefore apply to the period between the production or acquisition of the mercury or mercury compounds and their use as allowed to a party under the Convention. For information purposes, these guidelines include a section on the transport of mercury and mercury compounds.

9. The Basel Convention, in article 2, paragraph 8, defines the "environmentally sound management of hazardous wastes or other wastes" as "taking all practicable steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes".

10. On the basis of this definition, the environmentally sound storage of mercury and mercury compounds other than waste mercury can be considered to be storage in which the mercury or mercury compounds are managed in a manner that will protect human health and the environment against the adverse effects that may result from the storage of such mercury and mercury compounds.

11. While no strict definition of the maximum storage time is established for "interim storage", in line with the common use of the English word "interim" to mean "provisional" or "temporary", a party might wish to establish the maximum storage time to be considered "interim" storage at the national level.

12. A party to a legally binding instrument has consented to be bound by the obligations set out in that instrument. At the national level, the party may allocate responsibility for actions in relation to such obligations to entities operating within its territory. As the mercury and mercury compounds covered under article 10 are considered to be "commodity" substances (for a use allowed under the Convention as opposed to waste), it may be appropriate for responsibility for the environmentally sound interim storage of the mercury or mercury compounds to be delegated to the owner or custodian of the mercury or mercury compounds or to the entity that will gain commercial benefit from their use, under controls established by the party. A formal agreement between the owner of the mercury or mercury compounds and the manager of the storage facility may be required to formally delegate that responsibility. It should be noted that storage facilities may be owned privately or publicly, nationally or on a regional basis. Permission to operate an interim storage facility could be granted by the relevant national authority, and could specify quantitative limits for the amount of mercury or mercury compounds to be stored, along with relevant facility requirements. Entities that are not covered by permission arrangements should nevertheless be encouraged to follow these guidelines.

13. The Convention does not specify the amount of mercury or mercury compounds that may be stored prior to use. In certain jurisdictions, the same national controls may apply regardless of the quantity of mercury, while in others, different rules and standards may apply depending on the quantity stored. It is recognized that the guidelines may need to be applied flexibly in accordance with the requirements of specific sites. Article 3 of the Convention, on mercury supply sources and trade, specifies that each party shall endeavour to identify individual stocks of mercury or mercury compounds exceeding 50 metric tons, as well as sources of mercury supply generating stocks that exceed 10 metric tons per year, that are located within its territory. Guidance on the identification of such stocks and sources of supply is available in a separate guidance document adopted by the Conference of the Parties at its first meeting (UNEP, 2017b). Mercury and mercury compounds are expected to be stored in quantities commensurate with their intended use and the quantities considered necessary by the party to meet the requirements of domestic activities undertaken in accordance with the Convention, whether such activities consist of use in allowed mercury-added products, in processes using mercury or in ASGM.

14. In the case of ASGM, the quantities of mercury and mercury compounds stored should be commensurate with the baseline inventories and, where required, with reduction activities and targets specified in the national action plan provided for under article 7 of the Convention. The national action

plan may also address how the storage obligations under article 10 are to be met for ASGM-related activities and sites (taking into account these guidelines). The UNIDO technical guidelines for mercury management in ASGM (UNIDO, 2008) recommend that, when not used, elemental mercury (sometimes referred to as metallic mercury) be stored safely at all times in a secure location that is inaccessible to children, and in unbreakable air-tight containers with a protective coating to prevent mercury evaporation, and that mercury not be stored in a domestic residence. Countries developing their ASGM national action plans should refer to the guidance document on this topic (UNEP, 2017a). Where mercury is produced as a by-product (e.g., from mining processes), the quantity available may not be directly related to the quantities intended for use but may nevertheless be held in interim storage until it is determined whether it is to be used or disposed of.

15. Certain provisions of these guidelines may not be applicable for the interim storage of relatively small quantities of mercury or mercury compounds. Sections IV (A) and IV (B), for instance, are fully relevant for dedicated storage facilities but may not be fully applicable to small storage areas within large industrial plants. A party may apply the relevant parts of the guidance to such small storage areas at its discretion and as appropriate.

III. Overall management

16. To address the environmentally sound management of hazardous substances stored within their territory, parties may consider developing and implementing chemical management plans agreed on between the sectors involved, such as environment, labour and health. Such plans may include legislation, regulations, policies, agreements with industry, agreed standards, or any combination of these or other management mechanisms. Mercury and mercury compounds that are being stored pursuant to article 10 of the Convention should be included in any such management plan. To understand its needs for the interim storage of mercury and mercury compounds, a party may find it useful, during the development of its implementation activities, to identify the mercury and mercury compounds that are being held in its territory and to acquire a general understanding of the quantities of mercury and mercury compounds being stored in each location, in order to facilitate safe and appropriate storage. Such information can also contribute to the establishment of appropriate safety measures and regulatory inspection, as well as to the preparation of emergency response plans.

17. In relation specifically to mercury or mercury compounds, a national mercury inventory can provide useful information for all aspects of the implementation of the Minamata Convention. As is noted above, article 3 of the Convention requires parties to endeavour to identify individual stocks of mercury or mercury compounds exceeding 50 metric tons, as well as sources of mercury supply generating stocks exceeding 10 metric tons per year that are located within their territories. Parties may find it useful to also identify smaller stocks or supplies of mercury or mercury compounds as part of their overall management of mercury and include these in their national inventory, should they have one. It is also recommended that the guidance in this document be applied to such smaller stocks or supplies to the extent possible when it is effective and practical. The identification of any uses of mercury within its territory will assist a party in estimating the quantities of mercury that require storage. It should be noted that, while the intended use of the stored mercury may not always be known, attempts should be made to ascertain and record the intended use of the stored mercury to ensure it is not directed to a use that is not allowed under the Convention. In addition to national methodologies, the United Nations Environment Programme toolkit for identification and quantification of mercury releases (UNEP, 2017c) provides parties with additional resources and information. While the toolkit is primarily designed for the assessment of mercury emissions and releases, it is also a source of information on the uses of mercury and mercury compounds that may be useful at the national level.

18. The guidance on the identification of stocks adopted by the Conference of the Parties at its first meeting (UNEP 2017b) can be used to establish an information registry on mercury at the national level, which could assist with safety and regulatory inspections, as well as with the preparation of emergency response plans consistent with national regulations and legislation. At a minimum, a registry of approved sites for the interim storage of mercury may be needed to ensure that storage is undertaken in an environmentally sound manner.

IV. Environmentally sound interim storage

A. Location

19. A number of environmental, technical and social factors should be considered when selecting the location of storage facilities. Thus, an environmental impact assessment, as well as social, legal and economic assessments, should be conducted to determine the best available site.

20. The site of the storage facility should be chosen on the basis of various criteria, including but not limited to geological, hydrological, hydrogeological, biological, ecological, meteorological and political criteria. A storage facility site should be located:

(a) In a permafrost-free area, or on thaw-stable permafrost to avoid the consequences of thawing on the facility infrastructures, especially in a warming climate;

(b) Away from geologically unstable areas such as seismically active areas, to prevent damage to the facility infrastructures, or in an area where the systems can withstand anticipated earthquake loadings;

(c) As far as possible from environmentally sensitive areas that have sensitive flora or fauna, including threatened or endangered species;

(d) Away from sensitive locations such as floodplains, water courses, aquifers and wetlands; and

(e) Insofar as practical, away from areas affected by armed conflict.

21. The above may not apply, however, if additional engineering measures are put in place to ensure that the storage facilities can withstand the site limitations and meet technical design and legal requirements.

22. In selecting a location for a new storage site, consideration should be given to any domestic requirements, including those pertaining to issues such as zoning (including locating storage facilities away from residences) or other restrictions on land use.

23. It is suggested that public consultations be held to inform the local community about siting criteria and procedures for mitigating potential human health and environmental risks associated with the storage of mercury or mercury compounds, including emergency response plans in the event of an incident. In certain jurisdictions, public consultation processes may be governed by specific laws or regulations.

24. In assessing storage sites for mercury and mercury compounds, national considerations may lead to the use of certain criteria as "exclusion criteria". For instance, the presence of certain elements might rule out the possibility of using a particular site. Other national criteria may be considered as positive or negative factors but not as decisive factors in excluding the site as an option. National consideration of circumstances, including a determination of acceptable risks, may be taken into account in assessing the importance of the various criteria. The weighting of particular criteria may also be related to the site's effect on storage stability. Careful consideration should therefore be given to site location, along with the other factors that affect site selection, such as the expected volume of mercury or mercury compounds to be stored or the available controls for safe management of the mercury or mercury compounds.

25. In considering storage sites for mercury and mercury compounds, consideration could be given to whether national storage sites are necessary or whether mercury and mercury compounds pending a use allowed under the Convention for a number of countries could be stored in a centralized storage facility. This would be most relevant where there are a number of facilities in the same geographical area but in different countries.

26. A storage facility could be located near a point of import in order to minimize the need for transportation. Site access should be adequate for receiving mercury and mercury compounds and releasing them for use. Consideration should be given to factors that could affect site or facility security. At private facilities where mercury or mercury compounds are used, consideration should be given to the actual location of the storage space for mercury and mercury compounds within the facility, including ease of access to the mercury or mercury compounds. Site security should also be considered.

B. Construction of interim storage facilities, including provision of barriers

27. A legislative and regulatory framework should be in place to ensure that facilities for the interim storage of mercury or mercury compounds fully protect the environment and human health. There should be legislation containing detailed requirements for the design, operation and closure of the interim storage facilities. Storage facilities should have certain containment characteristics to ensure the safe and environmentally sound interim storage of mercury and mercury compounds (QSC, 2003). The protection of soil, groundwater and surface water should be carefully considered, particularly in the construction of facilities for the storage of large quantities of mercury or mercury compounds. Such protection could be achieved through a combination of a geological barrier and other impermeable barriers. A European Union directive, for instance, calls for storage sites to have engineered or natural barriers adequate for protecting the environment against mercury releases and a containment volume adequate for the total quantity of mercury stored (EU, 2011). Storage site development should be guided by the nature of the site, geology and other project-specific factors, as well as appropriate geotechnical engineering principles. Such factors may be less important for sites designed for the storage of small quantities of mercury or mercury compounds.

28. In building a new facility or retrofitting an existing one, consideration should be given to its size, layout and design, floor strength requirements, surface coatings, plumbing and drains, air flow and ventilation, and the acceptable temperature range for storing elemental mercury. The facility's size will depend on the amount of space needed for present and future storage and on the method of storage.

29. Facilities should be designed to facilitate the safe handling of containers and might include separate, self-contained areas for container shipping and receiving and for repackaging operations, as these are the operations most vulnerable to accidents and spillage of mercury and mercury compounds. In large, dedicated mercury storage facilities, the aisles in storage areas should be wide enough to allow for the passage of inspection teams and emergency equipment. Consideration should be given to the safety of loading activities. Handling areas inside the facility, where mercury or mercury compounds may be transferred between containers, should have negative pressure environments to avoid mercury emissions outside the building. Where indoor air is vented outside, parties should consider whether the levels of mercury and mercury compounds in the handling and storage areas call for venting via activated carbon or other mercury capture systems.

30. The storage site should be equipped with a fire protection system (EU, 2011). Emergency response plans should be developed in coordination with the local fire department to ensure that it is sufficiently informed, trained, equipped and otherwise prepared to safely handle any fires at the facility. To reduce the risk of fires, facilities should be constructed of non-combustible materials and non-combustible materials should be used for pallets, storage racks and other interior furnishings. To further minimize the risk of fire, it is suggested that battery-powered electric forklifts be used to transport the mercury or mercury compounds inside the storage facility (QSC, 2003).

31. A drainage and collection system for water discharged from storage sites could be installed within the sites to enable mercury monitoring and ensure that mercury and mercury compounds are not discharged to water systems.

32. Storage facility floors should be designed to withstand the load calculated using the actual conditions of the facility. A simplified method would be to design the floors to withstand 50 per cent more than the total load from the mercury or mercury compounds being stored. Storage facility floors should not be penetrated by any drains or plumbing. Sloped floors and open-flow gutters with rounded-down edges should be used to avoid trapping mercury or mercury compounds under gutter covers and to facilitate the collection of spills. The floors of storage facilities should be covered with mercury-resistant materials such as an epoxy coating. It may be preferable for the floors to be light-coloured to allow the detection of mercury droplets. Floors and their coatings should be inspected frequently to ensure that the floors have no cracks and the coatings are intact. Walls should be built of materials that do not readily absorb mercury vapour; porous materials such as wood should be avoided. It is important to prevent releases and minimize environmental and health impact by providing redundant systems such as secondary containment capable of handling an unexpected event, monitoring for releases, and measures to protect the workforce and the public from exposure. (US DOE, 2009; Euro Chlor, 2007). Additional relevant information is available on the website of the World Chlorine Council (see the list of references at the end of the present guidelines). The temperature in handling areas with greater potential for higher vapour levels and corresponding risks should remain as low as possible (UNEP, 2015). Storage areas should be clearly marked with warning signs (FAO, 1985; US DOE, 2009).

33. Mercury and mercury compounds should be stored indoors whenever possible. When they are stored in enclosed outdoor facilities, particular care should be taken to implement protective measures to prevent releases of mercury and mercury compounds into soil, groundwater and surface water. Stored mercury and mercury compounds should be protected from external factors to prevent damage to containers and the integrity of stored containers should be checked regularly.

34. Storage facilities should be secured to avoid theft and unauthorized access. Moreover, depending on the scale of the facility, monitoring procedures should be established for the operation and decommissioning phases of the storage sites so that potential adverse environmental effects of the storage sites can be identified rapidly and appropriate corrective measures taken.

C. Containers for the storage of mercury, including secondary containers

35. **Segregation:** The type of storage container used will depend on whether the material to be stored is elemental mercury or a mercury compound. Elemental mercury is a liquid at room temperature, while most mercury compounds are solids. Solids and liquids require different types of storage containers. Any risk of contamination of other materials should be avoided. Containers and packages holding mercury or mercury compounds should not be placed together with containers holding other substances. Separate storage areas, even within the same storage facility, should be established. Containers and packages should be marked and stored in a dry, secure place such as a warehouse or other space that is not usually frequented by people.

36. **Ventilation:** Areas used to store mercury or mercury compounds should not share ventilation systems with work or public areas. They should have their own ventilation systems or be vented directly to the outdoors. Ideally, ventilation systems for handling area should be filtered or include pollution control devices to capture any mercury vapour or dust release. Guidance developed by the United Nations Development Programme (UNDP, 2010) for mercury wastes generated by healthcare facilities provides detailed advice that can be used by many types of commercial facilities.

37. **Containers:** Elemental mercury in bulk form should be carefully packaged in appropriate containers, such as those identified in the *United Nations Recommendations on the Transport of Dangerous Goods: Model Regulations* (United Nations, 2017). Solid mercury compounds should be stored in sealed containers such as barrels or pails with well-fitting lids or in specially constructed containers that do not release mercury vapour.

38. Containers should meet the following criteria:

(a) They should not be damaged by any materials previously stored in them or have contained materials that could adversely react with mercury.

(b) Their structural integrity should be intact.

(c) They should not be excessively corroded.

(d) They should have a protective coating (paint) to prevent corrosion.

(e) They should be gas- and liquid-tight.

39. Appropriate materials for mercury containers include carbon (minimum ASTM A36) and stainless steel (AISI 304 or 316L) (EU, 2010), which do not react with mercury at ambient temperatures. No protective coating is needed for the inner surface of such containers as long as the mercury to be stored in them meets the purity standards for storage as elemental mercury and no water is present inside the container. Protective coatings (such as epoxy paint or electroplating) should be applied to all exterior carbon steel surfaces in a manner that does not leave any steel exposed. Coatings should be applied in a manner that minimizes paint blistering, peeling and cracking. Some plastics, such as high-density polyethylene, are permeable to mercury vapours and should be avoided. Seamless flasks and containers are recommended to eliminate the risk of breaches along the seams (QSC, 2003).

40. There are two main types of internationally approved mercury storage and transport containers: 34.5 kg flasks and one-metric-ton containers (QSC, 2003). The design type of the container should pass the drop test and the leakproofness tests as described in chapters 6.1.5.3 and 6.1.5.4 of the *United Nations Recommendations on the Transport of Dangerous Goods: Manual of Tests and Criteria* (EU, 2011). For transporting smaller quantities of mercury, other sizes (e.g., 1–16 lbs) and types (e.g., polyethylene, glass) of containers are often used (QSC, 2003); however, the level of protection such containers provide should be taken into account.

41. When storing mercury in containers, it is important to leave some "head space" to allow for thermal expansion of the mercury. In European Union guidance, the maximum filling ratio of a

container is 80 per cent by volume, and the head space is therefore at least 20 per cent (EU, 2011). Other jurisdictions specify a maximum filling ratio of 85 per cent, for a 15 per cent head space.

42. When mercury is stored, it should be as pure as possible in order to avoid chemical reactions and the degradation of containers. A mercury content greater than 99.9 weight per cent is recommended. For lower purity levels (95–99.9 weight per cent), it may be necessary to monitor the condition of the containers to detect any degradation over time.

43. Containers for elemental mercury should be stored upright on pallets off the ground, with no mercury or mercury compounds on the exterior surface. Alternatively, the packages could be placed in protective outer packaging such as a box or crate. The use of wood or other porous materials for pallets should be avoided as such materials are difficult to decontaminate after use. Elemental mercury in containers should be placed in containment trays or in a leak-proof area of the storage facility that ideally has curved edges to limit the potential accumulation of elemental mercury in any corners, and where spills can be contained. The liquid containment volume should be at least 125 per cent of the maximum liquid volume, taking into account the space taken up by items stored in the containment area.

44. **Labelling:** Labels including information on the names of the suppliers of the mercury, the origin of the mercury (if known), the level and purity of the mercury, the container number, the gross and net weight and the date when the container was filled with mercury should be affixed to each container, along with an appropriate corrosive label (US DOE, 2009). Care should be taken to use labels that are in line with the globally harmonized system of classification and labelling of chemicals (United Nations, 2015). In addition, among other things, the information that the container meets appropriate national and international technical standards regarding tightness, pressure stability, shock resistance and behaviour when exposed to heat should be available for mercury handlers.

D. Movement of mercury and mercury compounds

45. An inventory of the mercury and mercury compounds kept at a storage site should be created and updated as mercury and mercury compounds are added to the facility, used, removed from the facility or disposed of in accordance with article 11 of the Minamata Convention. The inventory sheet should be checked periodically against the containers stored at the facility to ensure its ongoing accuracy. Shipments of mercury and mercury compounds should be recorded, with consideration given to the requirements of article 3 of the Convention that pertain to the import and export of mercury from the country. The maintenance of tracking records is useful for auditing of facilities and for reporting under article 3 in relation to stocks of mercury or mercury compounds greater than 50 metric tons. Periodic reporting of the relevant information on mercury and mercury compounds stored or used may also be considered to obtain the data needed for reporting under article 3. Guidance on the determination of such stocks is available on the Minamata Convention website (UNEP 2017b).

46. Regular inspection and audits of storage areas should be undertaken, focusing especially on damage, spills and deterioration. Clean-up and decontamination should be carried out speedily, but not without alerting the authorities concerned (FAO, 1985).

47. All documents containing the required information, including the certificate accompanying the container and records concerning the destocking and dispatch of the mercury after its temporary storage, its destination and its intended use, should be kept for a nationally defined period after the termination of the storage. A number of parties consider at least three years to be appropriate.

E. Education and training of staff

48. Personnel engaged in the handling or storage of mercury or mercury compounds should have adequate appropriate training. Personnel who do not handle the mercury or mercury compounds in the storage area but could be exposed by an accidental release should also understand the risks and hazards of mercury and mercury compounds and be familiar with the facility's emergency response plans (QSC, 2003). Access to the storage area should be restricted to those with adequate training, including in the recognition of mercury-specific hazards and the handling of mercury and mercury compounds.

49. Employee training in environmentally sound management and workplace health and safety should be provided to ensure that employees are protected against mercury releases within the facility, exposure and accidental injury.

50. Employees should have basic knowledge of the following:

(a) The chemical properties and adverse effects of mercury;

(b) How to identify mercury and segregate it from other hazardous substances;

(c) Occupational safety standards relevant to mercury and mercury compounds;

(d) How to use personal protective equipment provided by the employer, such as body coverings, eye and face protectors, gloves and respiratory protectors, including how to properly handle and dispose of such equipment;

(e) Labelling and storage standards considered appropriate for the facility or facilities, container compatibility and dating requirements and closed-container requirements;

(f) How to safely handle mercury and mercury compounds using the equipment available at the facility;

(g) How to use engineering controls to minimize exposure;

(h) How to deal with accidental spills of mercury or a mercury compound; and

(i) How to use mercury vapour monitoring devices to identify possible sources of elevated mercury levels in the facility and provide workers with the information they require to ensure safety (e.g., when respiratory protection may be warranted).

51. It is important to have worker insurance and employer liability insurance as required under national law.

52. Materials useful for training employees include mercury awareness-raising packages such as the one developed by UNEP (2008) and UNEP publications available on the Minamata Convention website (http://mercuryconvention.org/Resources/Information/Publications/tabid/3429/language/en-US/Default.aspx). All training materials should be translated into local languages and made accessible to employees.

F. Timetables for repair, testing and maintenance

53. Regular inspections should be undertaken to ensure that the facility, including all equipment, is in good condition. Such inspections should include examination of the containers, spill collection areas, floors and walls to ensure that there are no mercury releases and that the equipment and any coatings are intact. The site security should be inspected. The inspection schedule may be determined by national regulations or instructions or by the facility manager. A clear plan for a regular monitoring and repair schedule should be in place before the facility starts operating. Routine maintenance evaluations should be undertaken and detailed records of inspections and maintenance should be kept.

54. Indoor air monitoring should be considered to check for leaks and protect workers on site. Such monitoring could be required under national or local legislation. A continuous indoor air monitoring system could be used to detect leaks as early as possible, with sensors positioned at ground and head levels and visual and acoustic alarm systems. A number of continuous mercury measurement systems are commercially available for some types of mercury monitoring. Alternatively, suitable monitoring may be undertaken through site sampling in the environment. When leaks are detected, the operator should immediately take all necessary actions to avoid any releases of mercury (EU, 2011).

55. The information obtained from monitoring can be used to determine whether the stored mercury and mercury compounds are being properly managed, to identify potential issues relating to possible releases or emission of or exposure to mercury and to help assess whether amendments to the management approach might be appropriate. A monitoring programme will help facility managers to identify problems and take appropriate measures to remedy them. All equipment, including monitoring equipment, should be subject to routine maintenance, including testing to ensure that it is properly calibrated and functioning correctly. Monitoring should also be carried out in peripheral areas to detect any potential impacts. If the results show exceedances of specific limits, action should be taken and/or remedial measures applied. A contingency plan should be in place.

56. All performance monitoring should be reported to the relevant government authorities. Governments may request the results of inspections, monitoring and remedial measures to be reported. Moreover, an annual report should be produced containing the results of the monitoring programme, an assessment of those results, any corrective actions and the relative success of the corrective actions. Data should be retained for an agreed period of time.

G. Emergency measures, including personal protective equipment

57. Site-specific plans and procedures should be developed for implementing the specific requirements identified for the storage of mercury and mercury compounds, in line with national standards and with the approval of the relevant safety and environmental management authorities. A

workable emergency plan should address public evacuation and procedures to be followed in the event of terrorism, fire or other disastrous events that could result in significant mercury releases both inside and outside the facility's perimeter. The plan should be in place and should be implemented immediately in case of accidental spillage or other emergencies (QSC, 2003). Nearby communities should be aware of the emergency plan and know how to follow its procedures. A person should be designated with the responsibility to authorize any changes to safety procedures that might be needed to facilitate the work of emergency response personnel in emergencies. Adequate access to the affected area should be ensured.

58. Emergency response plans or procedures should comply with local, regional and national requirements and include procedures for first responders, including fire department staff, emergency response personnel, ambulance personnel and local hospitals (QSC, 2003). While such plans can vary according to the physical and social conditions of each site, the principal elements of an emergency response plan include the identification of potential hazards; legislation governing emergency response plans; action to be taken in emergency situations, including mitigation measures; personnel training plans; communication targets (fire service, police, neighbouring communities, local government, etc.) and methods in case of emergency; and methods and schedules for the testing of emergency response equipment. Emergency response practice exercises should be conducted.

59. Emergency response plans or procedures should cover a number of different scenarios, which could include but should not be limited to:

(a) Damage to storage containers during handling, including distinctions between minor damage and catastrophic damage (e.g., complete failure of the seal on a container);

(b) Discovery of container leakage during routine inspections;

(c) Release occurring during repackaging operations; and

(d) Damage to the storage facility itself (e.g., owing to flood, fire, severe adverse weather, a serious accident or vandalism that compromises the physical integrity of the facility).

60. For each scenario, response guidance should identify:

(a) The equipment and procedures needed to address the release and the type of mercury or mercury compound;

(b) The first aid attendant and/or official first responder that will handle medical emergencies;

(c) The site official responsible for overseeing the assessment of the situation (i.e. whether it is a minor or major release) and supervising workers in addressing the release or accident;

(d) Procedures for notifying the other workers at the facility (particularly regarding the need to don personal protective equipment);

(e) When to contact local emergency response personnel for additional support;

(f) When to contact national environmental hotlines if they exist;

(g) When to notify the public and what action the public should take;

(h) When it is appropriate to evacuate non-essential workers from the facility; and

(i) When it may become necessary to evacuate all workers from the facility.

61. All equipment needed to address spills or releases of mercury or mercury compounds should be available on site and in good working order. The type of equipment required may depend on the scale of the facility. Such equipment may include sorbent materials, chemical reagent products that can be applied to elemental mercury spills to reduce mobility, shovels and other tools for picking up spilled materials and extra drums or other containers in which to place cleaned-up materials. Specialized vacuum cleaners (with carbon filters in their exhausts) may be used. Facilities should also have the capacity to appropriately contain and manage any contaminated wash water that may be generated.

62. When an emergency occurs, the first step is to investigate the site to ensure that all those who were near the spill are safe and have received any needed medical treatment. The second step is to notify the authorities and keep the site secured until the appropriate official has deemed the area safe for investigation. The person in charge should wear suitable personal protective equipment and approach cautiously from upwind, secure the scene and identify the hazard. Placards, container labels, shipping documents, safety data sheets, car identification charts and knowledgeable people on the

scene are valuable sources of information. The need to evacuate, the availability of human resources and equipment and possible immediate actions should then be assessed. In order to ensure public safety, a call to an emergency response agency should be made and, as an immediate precautionary measure, the spill or leak area should be isolated by at least 50 metres in all directions.

63. In case of fire, workers should first put on personal protective equipment. An extinguishing agent suitable for the type of surrounding fire should be used. Equipping the storage facility with a dry-pipe (water supply) fire suppression system and emergency response equipment is recommended. For further information, the *Emergency Response Guidebook* (US DOT and others, 2016) is a helpful resource. If the fire is confined to a given space, the mercury and mercury compound storage containers should be moved away from the fire, using utmost precaution. After the fire is extinguished, the mercury and mercury compound storage containers may need to be treated with a water spray until they are sufficiently cooled (QSC, 2003).

64. Any spillage of mercury or mercury compounds, even in small amounts, should be considered hazardous and cleaned up with caution. Spills should be reported to management and the date, time, inspector, location and approximate amount of mercury or mercury compounds should be documented and the records of such incidences maintained (QSC, 2003). Evaluating the type of mercury or mercury compound spilled, the spill's size and dispersal, proximity of the spill to residents and environmentally sensitive areas and whether the necessary clean-up resources and expertise are available is critical to determining the appropriate type of response for a mercury or mercury compound spill. If the spill is small and on a non-porous surface (such as linoleum), it can be cleaned up by facility personnel or workers and disposed of in an environmentally sound manner. If the spill is large or in cracks or crevices, it may be necessary to hire someone with suitable professional training should such personnel not be available at the facility. Large spills involving more than the amount of mercury or mercury compounds found in a typical household product should be reported to the relevant authorities. If there is any uncertainty as to whether a spill should be classified as "large", the relevant authorities should be contacted. Under certain circumstances outlined in the emergency plan, it may be advisable to obtain the assistance of qualified professional clean-up or air monitoring personnel regardless of spill size.

65. Guidance on clean-up of household spills is available on the websites of Environment and Climate Change Canada and the United States Environmental Protection Agency (US EPA) (see the list of references at the end of the present guidelines) and may be adapted for use in other situations. Spills of elemental mercury during commercial activities and in households have the potential to expose workers and the general public to hazardous mercury vapours. In addition, they are disruptive and costly to clean up. Clean-up procedures for small mercury and mercury compound spills are posted on the US EPA website.

V. General guidance on health and safety

66. The development and implementation of public health and safety activities and worker health and safety activities to prevent and minimize exposure to mercury and mercury compounds are key aspects of the environmentally sound storage of mercury and mercury compounds.

A. Public health and safety

67. Ensuring public safety is dependent on appropriate reporting of both routine and accidental mercury releases by facility operators. The timely reporting of such information to local authorities requires that both routine and emergency procedures for reporting releases, including to civil authorities and local emergency responders, be clearly established before a facility begins operation. People living and working near storage facilities may also be exposed to environmental, health and accident risks relating mainly to emissions and releases from work undertaken at the facility, as well as from transport to and from the facility. Adequate measures are necessary to prevent and minimize the impacts of such emissions and releases on human health and the environment. Monitoring programmes can help in identifying problems and taking appropriate measures to remedy them. Such programmes could include monitoring for any emissions or releases of mercury or mercury compounds outside the facility to determine there is any exposure of the local population. Facility operators may wish to host community awareness forums to address questions concerning facility siting, operations and emergency response plans.

B. Worker health and safety

68. Employers should ensure the health and safety of all employees while they are at work. An exposure assessment can be undertaken for all employees who are directly exposed to mercury or mercury compounds and appropriate monitoring and industrial hygiene practices adopted.

Colorimetric badges and/or personal monitoring equipment (vapour sampling devices) are needed for this kind of comprehensive exposure assessment and monitoring programme. Pre-employment physical examinations are carried out to establish a baseline for determining an individual's background mercury level and help to ensure that the employee has normal body chemistry for mercury removal. Personnel may have other considerations that should be handled on a case-specific basis. Medical monitoring programmes should also include periodic physical exams (e.g. every one to three years), regular blood tests and regular urinalysis. Consideration should be given to offering alternative job opportunities to workers who become pregnant or who are breastfeeding.

69. Every employer should obtain and maintain insurance, under an approved policy from an authorized insurer, providing a sufficient level of coverage in case of liability (including those that may require compensation) for bodily illness or injury sustained by employees arising from and during the course of their employment, in accordance with national law. Facility-specific health and safety plans should be in place at all facilities handling mercury or mercury compounds to ensure the protection of everyone in and around such facilities. Such plans should be developed by trained health and safety professionals with experience in managing health risks associated with mercury and mercury compounds.

70. The protection of workers who handle mercury or mercury compounds and of the general public can be achieved by the following means:

(a) Restricting facility access to authorized personnel;

(b) Ensuring that occupational exposure limits for hazardous substances are not exceeded by making sure that all personnel use appropriate protective equipment;

(c) Ensuring appropriate ventilation of facilities to minimize the risk of exposure to volatile substances or substances that can become airborne; and

(d) Ensuring that facilities comply with all national and regional laws on workplace health and safety.

71. Guideline values for mercury concentrations in drinking water and ambient air established by the World Health Organization (WHO) are 6 µg/L for inorganic mercury and 1 µg/m^3 for inorganic mercury vapour (WHO, 2008; WHO Regional Office for Europe, 2000). Governments are encouraged to monitor air and water, especially near sites where activities using mercury and mercury compounds take place. Some countries have established permissible levels of mercury in the working environment (e.g. 0.025 mg Hg/m^3 for inorganic mercury, excluding mercury sulphide, and 0.01 mg Hg/m^3 for alkylmercury compounds in Japan). Management operations should be conducted so as to satisfy any applicable requirements regarding permissible levels of mercury in the working environment, and facilities where such operations are conducted should be designed and operated in such a way as to minimize mercury releases to the environment insofar as technically possible.

VI. Risk communication

72. Governments, business people, consumers, experts, NGOs and other stakeholders need to work together to promote the smooth and efficient reduction of environmental risks. Understanding both the risks and each other's perspectives is essential, and risk communication is therefore important. Risk communication on the interim storage of mercury and mercury compounds includes, for instance, sharing information about and conveying stakeholders' understanding of risks relevant to siting, operation and decommissioning of storage facilities and transport of mercury and mercury compounds to promote rational actions. To support risk communication, it is important to deepen stakeholder understanding of the concept of risk, which is expressed as a probability, to provide information in a timely manner at each stage of risk assessment and to have an interactive communication system.

VII. Closure of a facility

73. A closure plan should be prepared during the design phase for the interim storage facility. This plan should be updated regularly to reflect any changes in site conditions from the design phase to the closure phase. At the end of a facility's life, all mercury, mercury compounds and mercury-contaminated materials should be removed during closure. Air, equipment and soil measurements may be taken to confirm that site closure has been undertaken in an environmentally sound manner. If contamination is present, the site should be treated as a contaminated site.

VIII. Information regarding transport of mercury and mercury compounds

74. The latest versions of the following documents should be consulted to determine specific requirements for the transport and the transboundary movement of mercury and mercury compounds:

(a) *International Maritime Dangerous Goods Code* (International Maritime Organization);

(b) *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (International Civil Aviation Organization);

(c) *Dangerous Goods Regulations* (International Air Transport Association, 2016); and

(d) *United Nations Recommendations on the Transport of Dangerous Goods: Model Regulations* (United Nations, 2017).

75. Mercury and mercury compounds should be transported in a safe and environmentally sound manner in order to avoid accidental spills; they should also be tracked during transport until they have reached their final destination. Prior to transport, contingency plans should be prepared to minimize environmental impacts associated with vehicle accidents, spills, fires and other potential emergencies. During transport, mercury and mercury compounds should be identified, packaged and transported in accordance with the relevant national regulations on the transport of dangerous goods, which are generally based on the model regulations in the United Nations recommendations on the transport of dangerous goods (United Nations, 2017). Detailed transport requirements are not included in the present guidance at this stage, as it is considered more appropriate for the relevant primary source to be consulted for such information.

76. Companies transporting mercury or mercury compounds within their own countries should hold authorization to transport dangerous goods and their personnel should have the necessary qualifications and certification to handle dangerous goods in accordance with applicable national and local rules and regulations. Transporters should manage mercury and mercury compounds in a way that prevents container breakage, environmental releases and exposure to moisture. National transportation legislation for hazardous substances or dangerous goods often controls packaging and labelling for transport at the national level. If no guidance is available at the national level, the resource materials for transboundary transport of dangerous goods (listed in para. 74 above) can be consulted. The Globally Harmonized System of Classification and Labelling of Chemicals (United Nations, 2015) should also be taken into account as appropriate. The shipping papers should include an emergency response telephone number and a certification that the shipment is in compliance with all regulations. In addition, the shipper should mark the containers with the appropriate signs, including the specified label, the proper shipping name and the UN number. For mercury, the specified label is "Corrosive", the proper shipping name is "Mercury" and the UN number is "UN 2809" (QSC, 2003).

77. The mercury shipment should be accompanied by a chemical analysis report that demonstrates the mercury's level of purity and identifies any contaminants.

78. Upon arrival, the transport vehicle should be visually inspected for any obvious leaks, spills, droplets or other pools of free elemental mercury and all suspected mercury sources should be documented and reported to management. The shipment is accepted as compliant or rejected as non-compliant on the basis of the inspection; a written report including all the relevant information should be kept by the facility (QSC, 2003). When rejecting the shipment, the facility operator should ensure that the required actions under the contingency plan have been taken without causing further spread of leakage outside of the facility.

79. To ensure that releases from the handling and transport of mercury or mercury compounds are kept to a minimum, it is important to raise the awareness of those involved (e.g., transporters, recyclers and treatment operators) about the risks of mercury. Such awareness-raising can be achieved through training activities such as seminars providing information on new systems and regulations and opportunities for information exchange, preparation and distribution of leaflets and dissemination of information via the Internet.

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